

**Amendments to the claims:**

This listing of claims will replace all prior versions, and listings, of claims in the application:

**CLAIMS**

1. (Amended) Short change gear, in particular for motor vehicles, comprising
  - at least a first input shaft;
  - a second input shaft
  - a first output shaft;
  - a second output shaft;
  - a drive shaft that is in torque transmitting connection with the first and second output shafts;
  - a first group of gear sets comprising at least one first gear set;
  - a second group of gear sets comprising at least one second gear set and being radially offset with respect to the first group of gear sets;
  - an intermediate shaft;
  - a first gear section in which the first input shaft is connectable with the first output shaft by means of the first group of gear sets;
  - a second gear section in which the intermediate shaft is connectable to the second output shaft by means of the second group of gear sets;
  - wherein the intermediate shaft is in gearing connection with the first-second input shaft;
2. (Amended twice) The short change gear of claim 1 further comprising:
  - a first drive pinion provided on the first output shaft;
  - a second drive pinion provided on the second output shaft;

~~wherein a plane in which the intermediate shaft being is in gearing connection with the first second input shaft as well as ;~~

~~wherein the first and second drive pinions are positioned in one and the same plane.~~

3. (Original) The short change gear of claim 1 wherein the second gear section comprises the second group of gear sets, at least one of these gear sets being positioned in front and at least one of these gear sets being positioned behind the gearing connection of the intermediate shaft to the second input shaft when viewed in either one of the 2 longitudinal directions of the intermediate shaft.

4. (Original) The short change gear of claim 1 wherein the number of second gear sets in the second gear section is at least as high as the number of first gear sets in the first gear section.

5. (Cancelled) ~~The short change gear of claim 1 further comprising:~~

~~a clutch adapted to connect the first input shaft with a motor shaft;~~

~~wherein the first input shaft is connectable to the first output shaft and is connected by means of the gearing connection with the intermediate shaft.~~

6. (Amended twice) The short change gear of claim 1 further comprising:

loose wheels being part of the first and second gear sets; and

mutual synchronizing mechanisms;

wherein the loose wheels of the gear sets in the gear sections are shifted by means of the mutual synchronizing mechanisms and the gear sets relate to consecutive forward gears.

7. (Cancelled) The short change gear of claim 1 wherein the first gear section comprises the gear sets for the 5<sup>th</sup> and the 6<sup>th</sup> gear, while the second gear section comprises the gear sets for the 1<sup>st</sup> to the 4<sup>th</sup> gear.

8. ~~(Cancelled)~~ The short change gear of claim 7 further comprising:  
a reverse gear set in the first gear section, said reverse gear set comprising:  
—— a fixed wheel;  
—— a loose wheel;  
—— an intermediate wheel; and  
—— a shaft bearing the intermediate wheel.

9. ~~(Cancelled)~~ The short change gear of claim 1 further comprising:  
—— a clutch at one end of the first input shaft;  
wherein the gearing connection is located on the first input shaft spaced apart  
from that end of the first input shaft where the clutch is provided.

10. (Amended) The short change gear of claim 1 further comprising:  
a first clutch;  
a second clutch;  
a second input shaft;  
—— wherein a motor shaft is connectable by means of the first clutch with the first  
input shaft that is connectable with the first output shaft; and  
wherein the motor shaft is connectable by means of the second clutch with the  
second input shaft that is positioned in coaxial relation to the first input shaft, and said  
second input shaft is connected to the intermediate shaft by means of the gearing  
connection.

11. (Original) The short change gear of claim 10 wherein the first gear section does not  
comprise any gear sets for even-numbered forward gears and the second gear section  
does not comprise any gear sets for odd-numbered forward gears.

12. (Original) The short change gear of claim 10 wherein the first gear section does not comprise any gear sets for odd-numbered forward gears and the second gear section does not comprise any gear sets for even-numbered forward gears.

13. (Original) The short change gear of claim 10 wherein the first gear section comprises the gear sets for the 2<sup>nd</sup>, 4<sup>th</sup> and 6<sup>th</sup> gear, and the second gear section comprises the gear sets for the 1<sup>st</sup>, 3<sup>rd</sup> and 5<sup>th</sup> gear.

14. (Original) The short change gear of claim 10 further comprising  
a fixed wheel;  
a loose wheel;  
an intermediate wheel rotatably borne on a shaft;  
wherein the second gear section comprises a gear set for ~~the~~ reverse gear in which the fixed wheel is connected to the loose wheel by means of the intermediate wheel.

15. (Original) The short change gear of claim 1 further comprising:  
a pump shaft connected to a motor shaft and provided coaxially and within the first input shaft that is designed as a hollow shaft.

16. (Amended) The short change gear of claim 1 wherein the gearing connection between the intermediate shaft and the first-second input shaft comprises gears on both shafts and an intermediate gear.

17. (Cancelled) ~~The short change gear of claim 1 wherein the gearing connection between the intermediate shaft and the first input shaft comprises a chain drive.~~

18. (Amended) Use of the change gear of claim ~~10~~ 5 as a manual change gear for motor vehicles.

16. (Currently Amended) The short change gear of claim 1 wherein the gearing connection between the intermediate shaft and the second input shaft comprises gears on both shafts and an intermediate gear.

17. (Cancelled)

18. (Currently Amended) Use of the change gear of claim 10 as a manual change gear for motor vehicles.

19. (Currently Amended) Use of the change gear of claim 10 as an automatic change gear for motor vehicles.

20. (Currently Amended) Use of the change gear of claim 10 as a power shift gear for motor vehicles.

21. (Original) Use of the change gear of claim 1 as a change gear installed in lengthwise orientation in a motor vehicle.

22. (Original) Use of the change gear of claim 1 as a change gear installed in transverse orientation in a motor vehicle.

**REMARKS/ARGUMENTS****Drawings**

Since the "plane" is not a tangible object but an imagined level in which the intermediate shaft, the second input shaft, and the first and second drive pinions are located, this plane is difficult to demonstrate in the existing drawings, but claim 2 has been amended in an effort to express more clearly that the plane is not an object but simply describes how the elements are positioned with respect to each other.

For illustration, please find enclosed a drawing demonstrating a cut through the transmission plane through elements 3, 8, 10, 11, 12 and 13. This figure could be submitted as an additional figure if the wording in claim 2 is still deemed to require additional demonstration in the drawings. Indication by the Examiner is respectfully requested if adding such figure is viewed as appropriate.

**Specification**

The abstract has been brought in line with the 150 words requirement and reworded to avoid language as indicated by the Examiner

**Claims**

Claim 6 has been amended as proposed by the Examiner by adding the word "of"

**35 U.S.C 112****Claim 11:**

It is believed that claim 11 is fully enabled. In this regard, the following passages in the specification are pointed out:

Page 3, first paragraph:

*Since both gear sections are independent from each other, it is immaterial which gear sets for which gears are provided on which shafts. Any imaginable combination of gear sets can be implemented in the respective gear sections.*

Page 3, last paragraph:

*Preferably, the number of gear sets in the second gear section is at least as high as the number of gear sets in the first gear section.*

Page 4 towards the end of the second paragraph:

*By splitting the entire gear box into 2 gear sections it is possible to configure the entire gear box with a very short overall length and at the same time be free to choose the gear transmission ratios of all gear sets freely as desired.*

Page 6, paragraph before last

*Favorably, the first gear section does not provide any gear sets for even-numbered forward gears and the second gear section does not provide any odd-numbered forward gears, or vice versa. Such a configuration satisfies the requirements made on a power shift gear in which no consecutive gears should be shifted by one and the same clutch. This configuration ensures that for shifting sequentially up or down alternately one of the gear section is connected by means of a clutch.*

Page 7, second paragraph:

*Providing the reverse gear together with one forward gear on the same shifting mechanism is of course also possible vice versa namely that the reverse gear is provided*

*in the same gear section with the even-numbered forward gears. Such a configuration guarantees that shifting between the 1<sup>st</sup> and the reverse gear is only possible by alternately operating the 2 clutches, which can advantageously be used for moving stuck vehicles out of their stuck condition.*

Page 10, last paragraph to page 11

*Both figures 3 and 4 demonstrate that the transmission according to the present invention is not limited to the shown embodiments. Any combination of gear set positioning is possible, both in relation to the gear section 1 and 2 as in relation to the position within the gear sections and in relation to positioning the synchronizing mechanisms either on the input shafts, the output shafts or the intermediate shafts. Additionally, the transmission is not limited to a particular number of gears but any number of forward or reverse gears is possible. For all mentioned features it applies that the transmission according to the present invention can be provided in any desired technically possible combination.*

The conclusion is that any combination of gears can be provided in any of the first or second gear sections. The man skilled in the art is fully enabled by the specification to do so. There are no obstacles whatsoever to overcome since the gear transmission ratios can be freely chosen, and the specification explains that and how this is possible. Since the specification points out that it is fully discretionary to locate certain gears in one or the other of the two gear sections, any combination is enabled. For enabling the man skilled in the art to choose any combination, it does not require to show identical drawings just with different gear numbers, in particular if the specification explains in detail how the combinations can be varied.

Claim 2:

As already outlined under the headline "Drawings" at the outset, the claim language of claim 3 has been amended to clarify that the plane is not only defined by the intermediate



shaft and the second input shaft, but in that *"the intermediate shaft being in gearing connection with the second input shaft as well as the first and second drive pinions are positioned in one and the same plane"* This defines the plane well since this means more than 2 objects in one and the same plane.

**Claim 3:**

This claim has been clarified by the language *"at least one of these gear sets being positioned in front and at least one of these gear sets being positioned behind the gearing connection of the intermediate shaft to the second input shaft when viewed in either one of the 2 longitudinal directions of the intermediate shaft"*.

This makes it clear in which direction this is viewed and that on either side one of these gear sets is located.

Further, it has been specified in claim 3 that the "gearing connection" connects "the intermediate shaft to the second input shaft"

**Claim 14:**

In claim 14 "the reverse gear" has been substituted by the term "a reverse gear", overcoming the antecedent basis objection.

**35 U.S.C. 102**

Page two, last sentence makes it clear what is achieved by the present invention, namely that

*"The intermediate gear implements a large radial offset between the gear sections in relation to the shafts and does therefore make the second gear section independent from the first."*

Likewise on page 2, first paragraph under of the headline "Summary of the invention", one of the objects of the invention has been pointed out, namely *"to provide a change gear with a very short overall length in the lengthwise direction"*

Even though already the presence of the intermediate shaft 8 distinguishes the subject-matter of claim 1 from Hoyer, and the presence of the intermediate shaft gives an indication that the two groups of gear sets are radially offset, this has been further clarified in claim 1 by adding explicitly that the first group of gear sets is radially offset to the second group of gear sets. This distinguishes the claimed subject-matter even further from the reference Hoyer (US 3,916,711). Before discussing Hoyer, in the following the present invention will be discussed in more detail:

As shown in the embodiment in Fig. 4, torque is transmitted through motor shaft 6 into clutches 5' or 5". In particular, clutch 5" transmits torque into the second input shaft 26, while the clutch 5' transmits torque into the first input shaft 3. The first input shaft 3 carries gears that form together with the gears on the first output shaft the first group of gear sets 1.

On the other hand, the second input shaft 26 transmits torque through the intermediate gear 10 into the radially offset intermediate shaft 8. This intermediate shaft 8 carries gears that form together with the gears on the second output shaft 9 the second group of gear sets 2.

This illustrates that the first and second group of gear sets are radially offset, in this particular example by means of the intermediate gear 10. Needless to say, other transmission elements such as for instance a chain could be used for accomplishing a

radial offset. To accomplish the very short overall length in a lengthwise direction, it is important though to have a radial offset of the two groups of gear sets 1 and 2.

Turning to Hoyer, there is no radial offset of the first and second group of gear sets. Even if the shaft denoted 19 is viewed as a first output shaft and the shaft 42 as a second output shaft, both shafts 19 and 42 are axially aligned. This means that the "main transmission group 6" and the "auxiliary transmission 7" – if comparable at all to 1<sup>st</sup> and 2<sup>nd</sup> group of gear sets according to the present invention - are coaxially aligned and this would be in clear contrast to one object the invention, namely to reduce the overall length of the transmission.

Apart from that, another significant difference of the transmission according to Hoyer in comparison with the claimed transmission is that Hoyer does not teach an intermediate shaft at all. The shaft 66 is correctly named "power output shaft" in the specification of Hoyer. As described in column 6, lines 3 to 56, the "power output shaft 66" is driven by shaft 55 through gears 72, 73 and 75. This connection can provide a parallel output through shaft 66 in parallel or instead of through output shaft 42. This means that shaft 66 has the function of a further power output shaft. Hoyer does therefore not teach any intermediate shaft at all, contrary to the subject-matter of present claim 1.

Put in other words, in Hoyer the drive shaft 5 and auxiliary drive shaft 55 both carry gears that mesh directly with the gears carried by the respective output shafts 19 and 42. This results in Hoyer teaching away from any intermediate shaft. In Hoyer, there is no use for any intermediate shaft, and one important reason for that is that the Hoyer transmission lacks any radial offset between the first and second group of gear sets but to the contrary teaches axial alignment.

The man skilled in the art would not even look at Hoyer to get a suggestion for solving a length problem. Hoyer teaches a "change gear transmission, especially for agricultural and construction industry vehicles, where the packaging does usually not require the same level of optimizing space usage. Exactly this is reflected by the relatively bulky

Hoyer transmission with coaxially placed main transmission group and auxiliary transmission group.

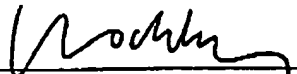
Like the power output shaft 66 in Hoyer cannot be compared to the intermediate shaft 8 according to the present invention, also the other elements cited in the office action dated October 6, 2005 cannot be compared to the transmission according to the present invention, in particular since the transmission taught by Hoyer distinguishes significantly in structure, i.e. the combination of and interaction of the various transmission elements as claimed in present claim 1. Therefore, the elements described in the dependent claims in combination with the features in present claim 1 are of different function as well.

Apart from Hoyer (US 3,897,699), also Berger et al. (US 6,874,381), Bulgrien (6,845,682), and the European Patents Applications published as EP 001130291A1 and EP 001124079A2 do not teach or suggest the combination of features as in the present set of claims.

In view of the present amendments and arguments, the applicant believes that all claims are now in condition for allowance. Therefore, the applicant respectfully requests that a Notice of Allowance be issued in this case.

Respectfully submitted

VIERING, JENTSCHURA & PARTNERS

By   
Alexander R. Schlee  
Reg. No. 55,912  
Tel.: (310) 545 9851

## SHORT CHANGE GEAR

Priority from the European Patent Application 03100580.4 is claimed, the content of which is herewith incorporated entirely by reference.

### FIELD OF THE INVENTION

The present invention relates generally to transmissions for use in motor vehicles and, more particularly, to short change gears.

### BACKGROUND OF THE INVENTION

A transmission is known from the European Patent EP 1 067 312. This kind of transmission can be configured as manual or automatic change gear or also as a power shift gear. In all of these variations the 2 output shafts are in torque transmitting connection with the drive shaft. In the manual and the automatic gear change version the transmission is provided with an input shaft that is connected by means of several gear sets with the first and with the second output shaft. Each gear set is provided with a fixed gear and a shiftable loose gear. Even though all gear shift mechanisms for shifting the loose wheels are located on the output shafts the interleaved positions of the fixed gears on the input shaft results in a certain overall length of the transmission that is longer than the space needed just for the loose wheels with the gear shift mechanisms. This applies also for the power shift gear version comprising 2 input shafts positioned coaxially to each other and that are likewise interconnected with the output shafts by means of several gear sets.

In the US 6 427 550 a twin-clutch transmission is described comprising one input shaft and one intermediate shaft, said intermediate shaft being connected by means of a chain drive with a transfer shaft coaxially disposed in relation to the input shaft. Input shaft and intermediate shaft are connected by means of several wheel sets with the output shaft. Even though this avoids the problem of interleaved positioning of the various gear sets since the loose wheels on the intermediate shaft and on the input shaft mesh with the same fixed wheels on the output shaft it is a known problem in the prior art that such

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shaft. Even though this avoids the problem of interleaved positioning of the various gear sets since the loose wheels on the intermediate shaft and on the input shaft mesh with the same fixed wheels on the output shaft it is a known problem in the prior art that such

## ABSTRACT

The invention provides a change gear, in particular in motor vehicles. This transmission comprises input and output shafts, a drive shaft that is in torque transmitting connection with the first and second output shafts; a first group of gear sets comprising at least one first gear set; a second group of gear sets comprising at least one second gear set; an intermediate shaft; and a first gear section. The input shaft is connectable with the first output shaft by the first group of gear sets. A second gear section is provided in which the intermediate shaft is connectable to the second output shaft by the second group of gear sets. The intermediate shaft is in gearing connection with the first input shaft.



**CLAIMS**

1. (Currently Amended) Short change gear, in particular for motor vehicles, comprising

a first input shaft;

a second input shaft

a first output shaft;

a second output shaft;

a drive shaft that is in torque transmitting connection with the first and second output shafts;

a first group of gear sets comprising at least one first gear set;

a second group of gear sets comprising at least one second gear set and being radially offset with respect to the first group of gear sets;

an intermediate shaft;

a first gear section in which the first input shaft is connectable with the first output shaft by means of the first group of gear sets;

a second gear section in which the intermediate shaft is connectable to the second output shaft by means of the second group of gear sets;

wherein the intermediate shaft is in gearing connection with the second input shaft.

2. (Previously Amended ) The short change gear of claim 1 further comprising:

a first drive pinion provided on the first output shaft;

a second drive pinion provided on the second output shaft;

wherein the intermediate shaft being in gearing connection with the second input shaft as well as the first and second drive pinions are positioned in one and the same plane.

3. (Original) The short change gear of claim 1 wherein the second gear section comprises the second group of gear sets, at least one of these gear sets being positioned in front and at least one of these gear sets being positioned behind the gearing connection of the

intermediate shaft to the second input shaft when viewed in either one of the 2 longitudinal directions of the intermediate shaft.

4. (Original) The short change gear of claim 1 wherein the number of second gear sets in the second gear section is at least as high as the number of first gear sets in the first gear section.

5. (Cancelled)

6. (Previously Amended ) The short change gear of claim 1 further comprising:  
loose wheels being part of the first and second gear sets; and  
mutual synchronizing mechanisms;  
wherein the loose wheels of the gear sets in the gear sections are shifted by means of the mutual synchronizing mechanisms.

7. (Cancelled)

8. (Cancelled)

9. (Cancelled)

10. (Currently Amended) The short change gear of claim 1 further comprising:  
a first clutch;  
a second clutch;  
wherein a motor shaft is connectable by means of the first clutch with the first input shaft that is connectable with the first output shaft; and  
wherein the motor shaft is connectable by means of the second clutch with the second input shaft that is positioned in coaxial relation to the first input shaft, and said second input shaft is connected to the intermediate shaft by means of the gearing connection.

11. (Original) The short change gear of claim 10 wherein the first gear section does not comprise any gear sets for even-numbered forward gears and the second gear section does not comprise any gear sets for odd-numbered forward gears.

12. (Original) The short change gear of claim 10 wherein the first gear section does not comprise any gear sets for odd-numbered forward gears and the second gear section does not comprise any gear sets for even-numbered forward gears.

13. (Original) The short change gear of claim 10 wherein the first gear section comprises the gear sets for the 2<sup>nd</sup>, 4<sup>th</sup> and 6<sup>th</sup> gear, and the second gear section comprises the gear sets for the 1<sup>st</sup>, 3<sup>rd</sup> and 5<sup>th</sup> gear.

14. (Original) The short change gear of claim 10 further comprising  
a fixed wheel;  
a loose wheel;  
an intermediate wheel rotatably borne on a shaft;  
wherein the second gear section comprises a gear set for a reverse gear in which  
the fixed wheel is connected to the loose wheel by means of the intermediate  
wheel.

15. (Original) The short change gear of claim 1 further comprising:  
a pump shaft connected to a motor shaft and provided coaxially and within the  
first input shaft that is designed as a hollow shaft.

16. (Currently Amended) The short change gear of claim 1 wherein the gearing  
connection between the intermediate shaft and the second input shaft comprises gears on  
both shafts and an intermediate gear.

17. (Cancelled)

18. (Currently Amended) Use of the change gear of claim 10 as a manual change gear for motor vehicles.

19. (Currently Amended) Use of the change gear of claim 10 as an automatic change gear for motor vehicles.

20. (Currently Amended) Use of the change gear of claim 10 as a power shift gear for motor vehicles.

21. (Original) Use of the change gear of claim 1 as a change gear installed in lengthwise orientation in a motor vehicle.

22. (Original) Use of the change gear of claim 1 as a change gear installed in transverse orientation in a motor vehicle.

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